Directions in Connected Lighting

Lighting: A New Ambient Computing IoT Platform based on Intel Architecture

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Nature of Computing is changing…

"We are at an inflection point in the history of Data and Computing. For the last 66 years since ENIAC, Data has always come to Computing. Not so going into the future. In the future, Compute will have to go where Data is. The future is about scaling and about Distributed Intelligence.

We neither have enough wireless bandwidth and spectrum to push data up from 50B Devices and 1 Trillion+ Sensors nor does it make economic sense to send senseless bits up the channel"

Sandhiprakash Bhide
Trillion Sensors Summit Japan Feb. 20-21, 2014, Tokyo Japan

Plethora of IOT Devices, but few critical ones are missing

Each one is a potential IOT End Node






Besides delivering lumens, these LED lights will usher a plethora of IOT End nodes delivering services

* Images obtained from the Google Search just for illustration

Vision for the Next Decade

With the LED revolution in action, we are seeing the demise of incandescent, halogen and traditional light bulbs, being replaced by the state of art super-efficient, long-life LED Bulbs on the planet

We have a tremendous opportunity to create a simultaneous revolution by ensuring every LED bulb on the planet also becomes a sensor, compute, and communication node as a part of planet-wide sensor network benefiting cities, homes, communities, businesses, and citizens around the world. Electric bulb, the most abundant end node of the electric supply chain with its proximity to humans can offer tremendous new value which would offset the deployment cost and provide further electricity savings

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Summary

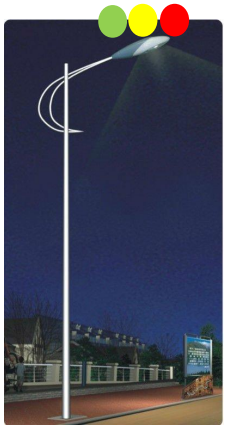
1. Opportunity: An Ambient Computing Platform from Intel to complement and accelerate your LED revolution and to deploy services → TTM

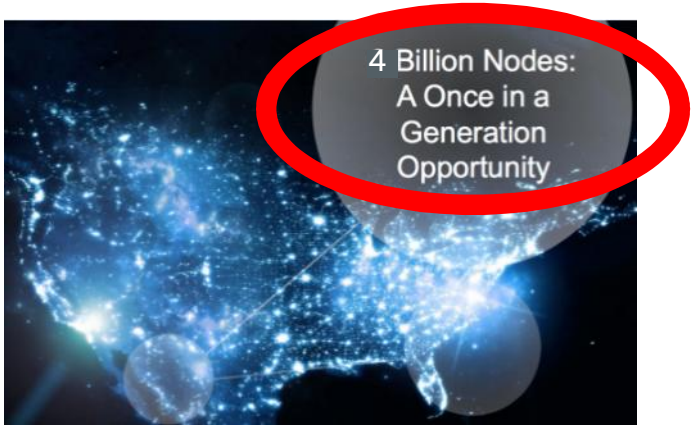
2. Billion $ revenue Opportunity for all of us from Si → Services
3. Broad Markets: Homes, Buildings, Offices, Smart Cities, Industrial, Retail, Utility, Digital Surveillance and Security, Hospitals/Healthcare
4. Benefit: Universal Socket (only change live, Neutral, and Earth connection), breadth of Si for edge processing (scalable SoC for intelligent LED edge), , E2E security, unique form factor design
5. Pre-tested/validated/certified reference platform in various form factors: PAR30 + tube light + Streetlight + Edge HW/SW + Our/Your cloud (Choice)

Internet of Things (intel)

Intel Architecture-based Ambient Computing IOT Platform can help you achieve your Revenue Growth, Cost Savings, and Customer Experience

Market Opportunity: 4B Streetlight + 500B light sockets





Sense the World, Process, Analyze and Act on the data

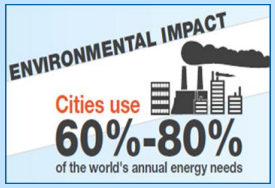
Environment	Weather	Pollution
• Ambient Light	• Temperature	• Smoke/Odor
• Power Monitoring	• Humidity	• NOx, HC, CO/CO_2
• Digital signs	• Rainfall	• Radiation/Radon
• Ultrasound	• Wind	• Chemical Spills
• Motion	• Seismic	• Meth
• RT Location System	• Pressure	• Particulate Matter
• Audio/Video	• UVA/UVB	• Garbage

Using Intel Technology/Ambient Computing IOT Platform

*RTLS: Real time location system

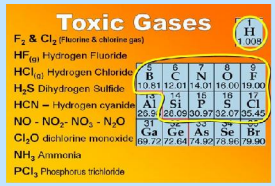
Range of Use Cases to deploy New Services

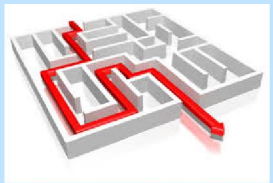
Smart Cities



Smart Homes/Buildings

Industrial/Retail





Solving Real Problems: Multiple usages can be addressed via 24x7 access to connected sensors driving edge Analytics

A New Intel Architecture-based Ambient Computing Platform to complement the LED Bulb revolution

Pre-Configured/Validated/Certified platform, OS, sensors, drivers, audio/video/sensor Edge Processing, Integrated LED Driver Logic + Comms + Analytics + E2E security + Device/Asset management + Mesh Network + Apps

There are Challenges to IoT Scale …

- Security, Privacy, and Compliance
- Fragmentation of Vertical Markets
- IT/OT and Legacy Infrastructure Integration
- Connectivity
- Underutilized Data
- Interoperability and Standards

And, Intel's Approach Will Help Accelerate Growth …

Reusable Building Blocks for Faster TTM

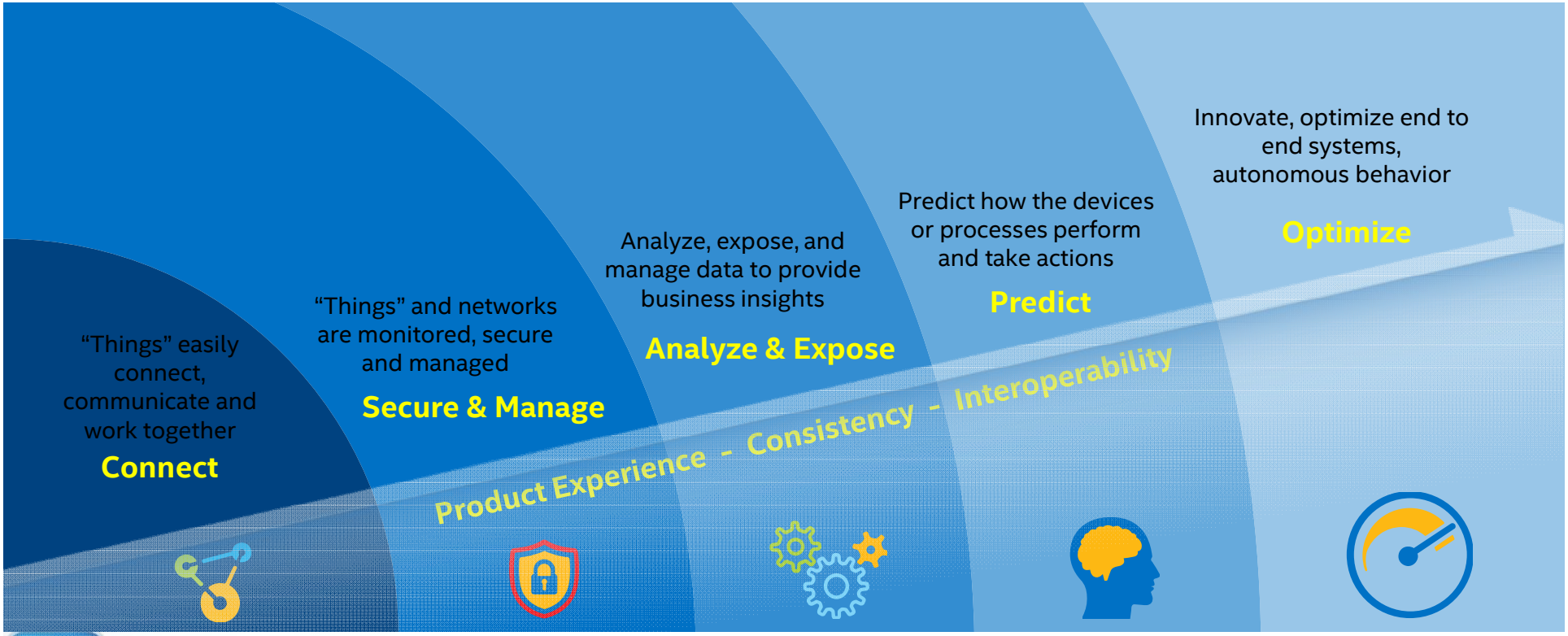
Actionable Intelligence from the Edge to the Cloud

Secure, Open and Scalable Products

Internet of Things intel

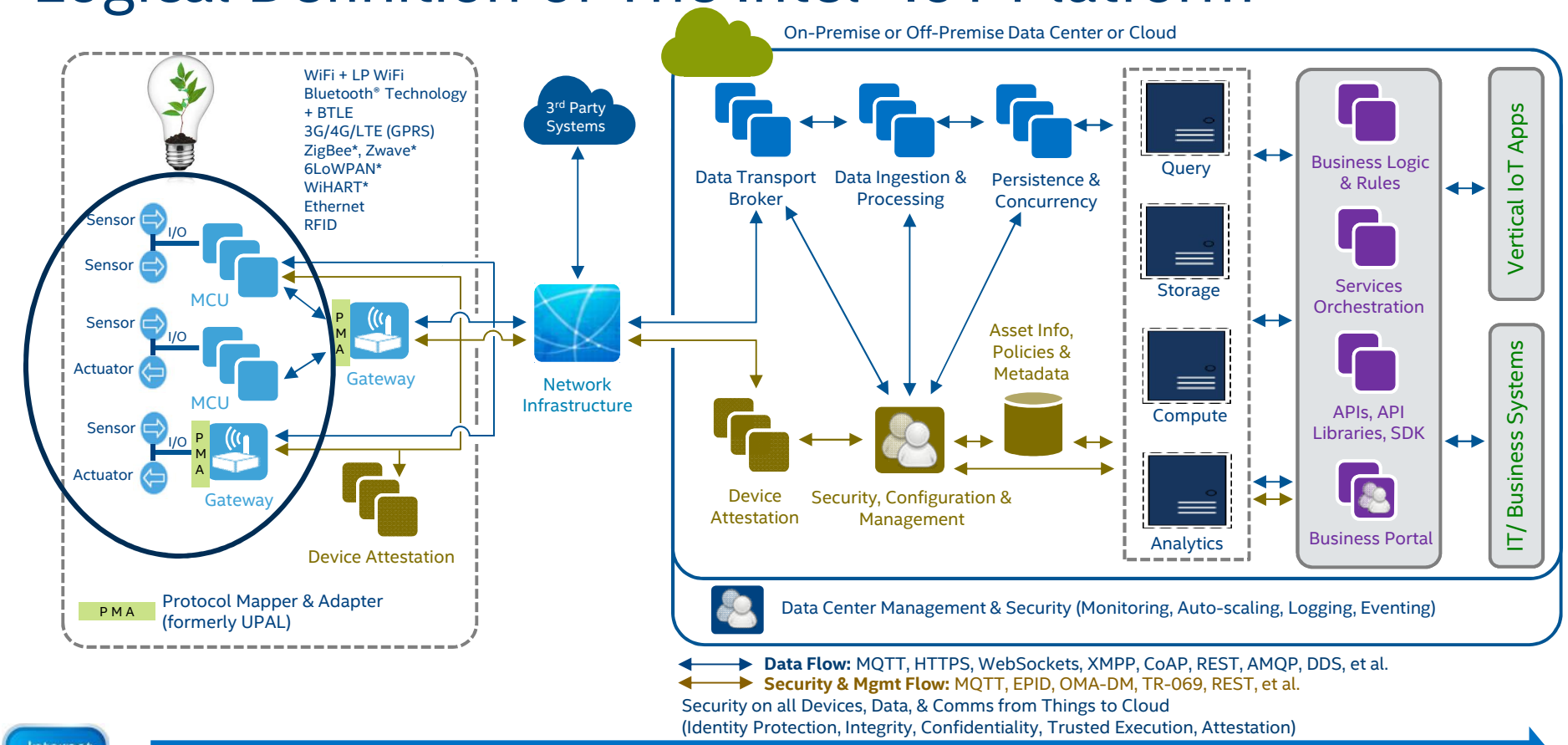
Intel® IoT Platform Capabilities:

Increasing IoT intelligence and value over time



Critical Tenets to Drive IoT Leadership

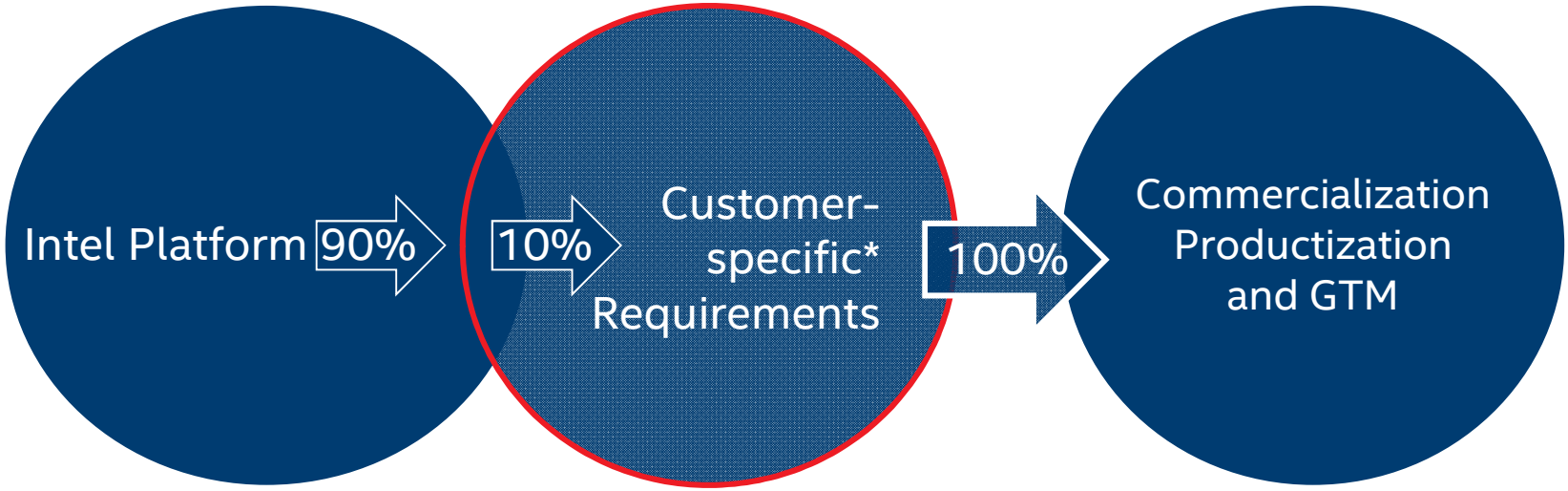
Logical Definition of The Intel® IoT Platform



Intel's platform will interface with any cloud

*Other names and brands may be claimed as the property of others.

Deployment Model



* Customer-specific = In terms of Sensors, Comms, Processing, OS, analytics, Apps, Security,. Device Manageability, work-loads…

Key Considerations

1. Ease of deployment with little or no infrastructure changes
2. Most processing at the edge to convert data to information
3. P2P Mesh N/W + E2E Client to cloud Connectivity + Autonomous mode + Local Control Mode
4. Minimal wireless backhaul usage
5. Head room for future expansion for the life of the product
6. Security, Device Manageability, and Asset Management

Intel's Ambient Computing IOT Platform Capabilities

1. Sensing as well as actuation management
2. E2E Security and Manageability
3. Device Management: Individual end-node, Logical group, or physical group
4. Four modes: Local, Autonomous, P2P Mesh, E2E end-node to Cloud
5. Raw or Derived data visualization
6. OTA OS, firmware, policies, analytics updates
7. Multiple interface support MTLS, HTTPS, MQTT, (future: DDS, XMPP, …)
8. Full local analytics at end node and temporal analysis in the cloud

Intel's Value Add

1. Pre-integrated/pre-validated offering similar to Intel IoT Gateway, built using Intel IoT Platform Products
2. Connect through Intel IoT Gateway or direct to the cloud thru AP
3. No new/external wiring/boxes, Easy Power Delivery
4. Easy to Install into existing socket/form factors
5. Strong Edge Analytics Platform – Full Audio/Video Edge Processing
6. Same SW stack across form factors
7. Application beyond just light control
8. Relationship with Retail, Industrial, energy, Healthcare, Smart homes and buildings, Telecom Service Providers, eco-system partners

Conclusion

1. Opportunity: An Ambient Computing Platform from Intel to complement and accelerate your LED revolution and to deploy services → TTM

Intel's New Ambient Computing (AC) Platform

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Internet of Things intel

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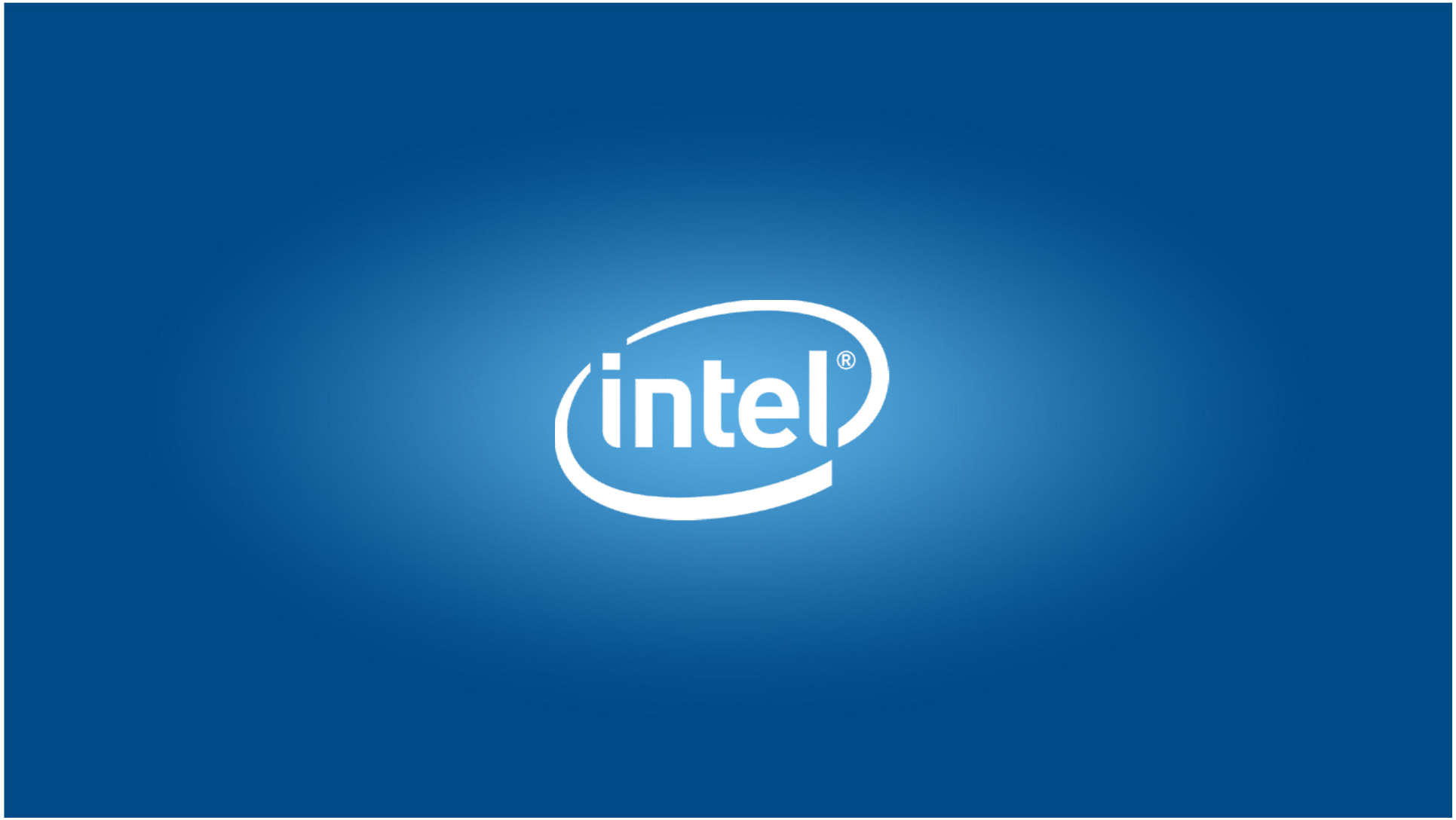
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